UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/177,814	10/23/1998	TERRY L. GILTON	353OUS(97-12	3621

7590 01/16/2003

JOSEPH A WALKOWSKI
TRASK BRITT & ROSSA
P O BOX 2550
SALT LAKE CITY, UT 84110

EXAMINER	
GABEL, GAILENE	
ART UNIT	**PAPER NUMBER**
1641	24

DATE MAILED: 01/16/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	**Application No.** 09/177,814	**Applicant(s)** GILTON, TERRY L.
	Examiner Gailene R. Gabel	**Art Unit** 1641

-- The MAILING DATE of this communication appears n the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *17 October 2002* .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,3-11,13-44,46,48-64,66-74 and 105-107* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,3-11,13-44,46,48-64,66-74 and 105-107* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Applicant's Response

1. Applicant's response filed 10/17/02 in Paper No. 23 is acknowledged. Currently, claims 1, 3-11, 13-44, 46, 48-64, 66-74 and 105-107 are pending and are under examination.

Rejections Withdrawn

Claim Rejections - 35 USC § 102/103

2. In light of Applicant's argument, the rejection of claims 21 and 41 under 35 U.S.C. 103(a) as being unpatentable over Isaka et al. (US 5,482,598) in view of Overton et al. (US 5,611,846) as applied to claims 1, 3-5, 7, 9-11, 13, 16, 18-20, 25, 29-32, 34, 38-39, 43, 46, 48-53, 56, 64, 69-71, and 73 above, and further in view of Wang et al. (US 5,663,488) is hereby, withdrawn.

3. In light of Applicant's argument, the rejection of claim 105 under 35 U.S.C. 102(e) as being anticipated by Thakur (US 6,225,159) is hereby, withdrawn.

Rejections Maintained

Claim Rejections - 35 USC § 102/103

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in-
> (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effect under this subsection of a national application published under section 122(b) only if the international application designating the United States was published under Article 21(2)(a) of such treaty in the English language; or
> (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that a patent shall not be deemed filed in the United States for the purposes of this subsection based on the filing of an international application filed under the treaty defined in section 351(a).

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

4. Claims 1, 3-5, 7, 9-11, 13, 16, 18-20, 25, 29-32, 34, 38-39, 43, 46, 48-53, 56, 64, 69-71, and 73 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Isaka et al. (US 5,482,598) in view of Overton et al. (US 5,611,846) for reason of record.

Isaka et al. disclose a chromatograph apparatus comprising a microchannel element formed on a semiconductor substrate. Specifically, the apparatus includes a semiconductor substrate and a matrix (microchannel) which extends across the substrate. The semiconductor substrate comprises of silicon (see column 6, lines 5-7). The matrix is formed with a desired pattern, i.e. linear, circular, on the semiconductor substrate by incorporating a porosity thereon in order to create a porous portion with increased pore size and extended branching of the pores on the semiconductor surface (see Abstract and column 1, lines 35-46). The length of the matrix channel is not limited although its length is preferably larger than its diameter (see column 2, lines 18-25). The porosity is preferably 10-90% (see column 2, lines 60-63). Optimal pore size and pore shape can be achieved in accordance with the substance to be separated and measured, i.e. selecting the type and concentration of a dopant (see column 3, lines 35-42). A thin semiconductor substrate layer may be formed by ion injection after formation of a silicon dioxide layer by thermal oxidation (see column 4, lines 53-55). The apparatus is applicable for use in solid-gas separation, solid-liquid separation, liquid-liquid separation, and gaseous separation. The separation makes use of the difference in flow rate between gases and liquids or in reactions (enzyme reaction) involving capture substrate (absorptivity involving immobilized enzyme) (see column 3, lines 1-14 and 50-54). In liquid chromatographs, an inlet port of the apparatus is coupled to a pump (migration facilitator) into the porous channel to identify difference in elution time between two liquids using differential refractometer (see column 5, lines 17-29). Isaka et al. also disclose ion column detection performed on a capillary, i.e.

absorption detector (see column 3, lines 16-24). Finally, Isaka et al. teach incorporation of a sealing element (cover) consisting of a single-crystal silicon film on the silicon substrate on which the matrix is formed (see column 5, lines 38-49).

Isaka et al. differ from the instant invention in failing to teach forming at least two porous microchannels in the silicon substrate.

Overton et al. disclose a chromatograph apparatus including a separation column that separates sample mixtures into individual components (see column 1, lines 23-25). The separation column is capable of separating analytes from gaseous, liquid, or solid phases (see column 3, lines 1-3). The apparatus also includes a microprocessor that is capable of controlling temperature, sample pumps, and gas pressures, and a valve pneumatics system that injects samples containing analyte into the column (see column 4, lines 49-52). Overton et al. disclose that the chromatograph may have different specific configurations to fit intended uses such as the incorporation of two parallel different columns in an analyzer module with corresponding detectors alongside thereto; i.e. a small scale micro thermal conductivity detector (see column 9, lines 30-46 and column 11, lines 53-59). Figure 2(b) illustrates multiple injectors and multiple columns in the apparatus.

It would have been obvious to one of ordinary skill in the art at the time of the instant invention to incorporate multiple separation columns as taught by Overton into the miniaturized chromatograph apparatus of Isaka because Overton specifically taught multiple columns in various configurations for different intended applications suggesting

that fabrication and use of multiple columns in separation chromatographs is well within ordinary skill.

5. Claims 8, 26-28, 35-37, and 66-68 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Isaka et al. (US 5,482,598) in view of Overton et al. (US 5,611,846) as applied to claims 1, 3-5, 7, 9-11, 13, 16, 18-20, 25, 29-32, 34, 38-39, 43, 46, 48-53, 56, 64, 69-71, and 73 above, in further view of Swedberg et al. (US 5,571,410) for reason of record.

Isaka et al. and Overton et al. have been discussed supra. Isaka et al. and Overton et al. differ in failing to teach antibody or antigen as the capture substrate for the miniaturized chromatograph.

Swedberg et al. teach a miniaturized planar column device for integrated sample analysis of analytes (see column 8, lines 5-38). Swedberg et al. specifically teach a stationary phase (sample treatment component) which performs a filtration function filled with a biocompatible porous medium of particles into which a capture function has been incorporated therein (see column 27, lines 33-61 and Example 1). Specifically, Swedberg teaches a stationary phase incorporated into a miniaturized affinity chromatography column onto which separation and capture functions are combined; the capture species (biological affiants) include antibodies, antigens, lectin, enzyme etc. (see column 27, lines 43-61 and Example 1). Swedberg et al. also disclose a "LIGA" process which is used to refer to a process of fabricating microstructures having high aspect ratios and increased structural precision in order to create desired uniformity in

microstructures such as channel ports, apertures, and microalignment means (see column 13, lines 9-33).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the stationary phase in the porous matrix taught by Isaka, in a device having multiple columns as modified by Overton, to include antigens and antibodies as taught by Swedberg in order to achieve performance of both filtration and capture function because Swedberg specifically suggested potential application of his teachings in monitoring biological analyses as applied to liquid phase separation devices in the miniature scales such as the device taught by Isaka. One of ordinary skill in the art would have been motivated to incorporate the teachings of Isaka with biocompatible modification as taught by Swedberg because Isaka specifically taught that porous silicon has established porosity with enhanced capacity for separation, augmented adsorption, differentiation of flow rate in liquid or gaseous samples, thereby producing a highly versatile miniaturized chromatographic device capable of both enhanced partitioning and complexation reactions.

6. Claims 14-15, 17, 21, 40-41, 44, and 54-55 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Isaka et al. (US 5,482,598) in view of Overton et al. (US 5,611,846) as applied to claims 1, 3-5, 7, 9-11, 13, 16, 18-20, 25, 29-32, 34, 38-39, 43, 46, 48-53, 56, 64, 69-71, and 73 above, and further in view of Miura et al. (US 5,132,012) for reason of record.

Isaka et al. and Overton et al. have been discussed supra. Isaka et al. and Overton et al. differ in failing to teach incorporating a field effect transistor detector, memory device, and controls into the apparatus.

Miura et al. disclose a miniaturized sample separator in the form of a liquid chromatograph comprising an analyzing chip in which the capillary flowpath is formed in a substrate and a field effect transistor detector disposed downstream of the capillary (see Abstract). The substrate is made of silicon and further has an insulative membrane formed of silicon dioxide (see column 3, line 51 to column 4, line 7). Both the column for separation and the field effect transistor detector are formed integrally with the substrate. After the silicon oxide layer has been formed on the capillary groove, a stationary phase is formed. A valve is connected to a first end of the flow path in the sample application area (sample introduction pipe) where a sample is selectively introduced into the flowpath. A separation carrier solution (carrier gas/ vacuum source) is fed under pressure by a feed pump and then discharged from a drain after having passed through the flowpath. Miura et al. further teach a sealing element (seal plate) such as borosilicate glass for sealing the opening portion of the groove portion to define the flow passage for a liquid sample. The liquid chromatograph also comprise a memory (control) device and an output device such as a data processor which is connected to the detector for detecting separated constituents (see column 5, line 63 to column 6, line 22). Figures 4A and 4B illustrate an electrical conductivity detector which comprise voltage application and current detection components, i.e.

electrodes. Figure 9 shows a schematic view of the overall flow passage of the liquid chromatograph.

It would have been obvious to one of ordinary skill in the art at the time of the instant invention to incorporate field effect transistor detector, memory device, and controls as taught by Miura into the miniaturized chromatograph apparatus with porous silicon channels such as taught by Isaka as modified by Overton, because Miura specifically taught application of such elements into miniaturized chromatographic devices such as taught by Isaka. One of ordinary skill in the art at the time of the invention would have been motivated to combine the teaching of Miura into the chromatograph device of Isaka as modified by Overton, because Miura recognized and solved technical difficulties in miniaturizing analyzers by incorporating these necessary elements into his device (rather than providing them independently of each other).

7. Claims 22-24, and 42 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Isaka et al. (US 5,482,598) in view of Overton et al. (US 5,611,846) as applied to claims 1, 3-5, 7, 9-11, 13, 16, 18-20, 25, 29-32, 34, 38-39, 43, 46, 48-53, 56, 64, 69-71, and 73 above, and further in view of Northrup et al. (US 5,882,496) for reason of record.

Isaka et al. and Overton et al. have been discussed supra. Isaka et al. and Overton et al. differ in failing to teach the migration facilitator as comprising electrodes disposed into the porous region of the chromatograph.

Northrup et al. disclose fabrication and use of porous silicon structures to increase surface area of miniaturized electrophoresis devices and filtering or control flow devices (see Abstract). Northrup et al. specifically disclose that porous silicon which is fabricated from crystalline silicon have very small pore diameters so that they can be produced with relatively high degree of uniformity and control (see column 1, lines 27-55). Northrup et al. teach that because of its high surface area and specific pore size, porous silicon can be utilized for a variety of applications on a miniature scale for significantly augmenting adsorption, vaporization, desorption, condensation, and flow of liquids and gasses while maintaining the capability of modification such as being doped or coated using conventional integrated circuit and micromachining (see Summary). Electrodes within or adjacent the porous membrane can be used to control flow or electrically charged biochemical species such as in electrophoresis (see column 5, lines 21-67). Figure 3 illustrates porous silicon embodiment on a controlled flow interface device. Figure 8 illustrates a porous silicon electrophoresis device. A negative electrode is formed at one end (inlet) of the porous silicon column and a positive electrode is formed is formed at an opposite end (outlet) of porous silicon columns, thereby forming microelectrophoresis channels (see column 7, lines 38-50).

It would have been obvious to one of ordinary skill in the art at the time of the instant invention to incorporate electrodes such as taught by Northrup into the miniaturized silicon device taught by Isaka as modified by Overton because Northrup specifically taught application of electrodes into miniaturized porous silicon structures in

electrophoresis devices or such as in the miniaturized separation device taught by Isaka.

8. Claims 6, 57-62, and 72 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Isaka et al. (US 5,482,598) in view of Overton et al. (US 5,611,846) as applied to claims 1, 3-5, 7, 9-11, 13, 16, 18-20, 25, 29-32, 34, 38-39, 43, 46, 48-53, 56, 64, 69-71, and 73, in further view of Northrup et al. (US 5,882,496) and Sunzeri (US 5,536,382) for reason of record.

Isaka et al. and Overton et al. have been discussed supra. Isaka et al. and Overton et al. differ in failing from the instant invention in failing to teach an electrophoretic apparatus comprising porous silicon columns and incorporating a control column into a separation device comprising porous silicon.

Northrup et al. has been discussed supra.

Sunzeri discloses analysis of constituents of human biological fluids using capillary electrophoresis. Sunzeri specifically teaches the use of standard control to provide a standard for quantitation (see column 9, lines 28-67). Sunzeri further teaches that quantitation using internal and external standards is beneficial in assays where the sample matrix affects fluorescence sample quenching (see column 10, lines 1-34).

It would have been obvious to one of ordinary skill in the art at the time of the instant invention to incorporate internal standards or controls as taught by Sunzeri and migration facilitator as taught by Northrup, into the miniaturized chromatographic device taught by Isaka as modified by Overton and Northrup, because internal controls or

standards in column chromatographic devices are conventional and are standard laboratory practice to those well within ordinary skill.

9. Claim 105 stands rejected under 35 U.S.C. 102(e) as being anticipated by Thakur (US 6,225,159) for reason of record or as follows.

Thakur discloses an ultrasmall flow channel device (trench capacitor) comprising a flow inlet and a flow channel (elongate trench) formed on a surface of a semiconductor substrate which comprises silicon matrix and wherein a selected layer of the amorphous silicon is converted to hemispherical grained silicon (HSG) (see claim 33, column 6, lines 33-62 and column 7, lines 17-30).

10. Claim 105-107 stands rejected under 35 U.S.C. 102(e) as being anticipated by Thakur et al. (US 6,126,847) for reason of record or as follows.

Thakur et al. disclose ultrasmall flow channels formed in semiconductor devices comprising a flow inlet and a flow channel (elongate trench) on a surface of the substrate which includes silicon oxide and wherein HSG is selectively etched and formed thereon (see column 3, line 57 to column 4, line 34, Figure 3, and column 5, lines 27-43). Different layers of silicon oxide are subsequently deposited and selectively roughened by subjecting the surface to seeding and annealing steps; thus transforming the smooth silicon layer to a roughened surface of HSG silicon (see Figure 3, column 5, lines 27-43, and column 6, lines 3-9).

11. Claims 33, 63, and 74 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Isaka et al. (US 5,482,598) in view of Overton et al. (US 5,611,846) as applied to claims 1, 3-5, 7, 9-11, 13, 16, 18-20, 25, 29-32, 34, 38-39, 43, 46, 48-53, 56, 64, 69-71, and 73 above, further in view of Northrup et al. (US 5,882,496), and in further view of Crenshaw et al. (US 5,726,085) for reason of record or as follows.

Isaka et al. and Overton et al. Is discussed supra. Isaka et al. and Overton et al. differ from the instant invention in failing to teach that the porous silicon matrix comprises hemispherical grained silicon (HSG).

Northrup et al. has been discussed supra.

Crenshaw et al. disclose a capacitor wherein a thin layer of HSG is deposited over a doped polysilicon region and then etched using etch chemistry, to increase surface area (see column 1, lines 51-65, column 3, and Figure 4C).

It would have been obvious to one of ordinary skill in the art at the time of the instant invention to substitute the porous silicon matrix disclosed by Isaka or Northrup as modified by Overton, with HSG as taught by Crenshaw because Crenshaw taught using HSG on capacitors to increase surface area and Northrup specifically taught that porosity in silicon structures increases surface area in miniaturized separation flow channels such as in his electrophoresis device or the microchannel separation device disclosed by Isaka and HSG appears to constitute an obvious variation of porous silicon used in separation devices. Further, both devices taught by Isaka and Northrup appear to be generic with respect to the type of porous silicon used in their microchannel devices.

Response to Arguments

12. Applicant's arguments filed 4/23/02 have been fully considered but they are not persuasive.

A) Applicant argues that the Office has not established a prima facie case of obviousness with respect to independent claims 1, 30, 51, and 64 because 1) the Office has failed to establish a reasonable expectation of success of the proposed combination, 2) the Office has not made particular findings, based on the evidence of record, as the reason the ordinary skilled artisan, with no knowledge of the claimed invention, would have selected these components for combination in the manner claimed, 3) the combination proposed by the Office does not teach or suggest all the limitations of the independent claims, and 4) the Office's reliance on Overton is improper because it teaches nonanalogous art.

In response, the rejection of claims 1, 3-5, 7, 9-11, 13, 16, 18-20, 25, 29-32, 34, 38-39, 43, 46, 48-53, 56, 64, 69-71, and 73 is based on an obvious combination of the teachings of Isaka and Overton. Specifically, Isaka was cited as a primary reference for his teaching of a column chromatograph that includes a single porous silicon column formed on a semiconductor substrate which comprises of silicon. The column is coupled to a pump to identify difference in elution time between two liquids using differential refractometer. The apparatus also includes a detector and a sealing element consisting of a single-crystal silicon film on the silicon substrate on which the matrix is formed. Overton was cited as a secondary reference only for his teaching of multiple

columns in miniaturized column chromatographs. It would have been obvious to one of ordinary skill in the art at the time of the instant invention to incorporate multiple separation columns as taught by Overton into the miniaturized chromatograph apparatus of Isaka because Overton specifically taught multiple columns in various configurations for different intended applications suggesting that fabrication and use of multiple columns in separation chromatographs is well within ordinary skill. It has also been held that mere duplication of the essential working parts, in this case, duplication of separation columns in a column chromatograph, involves only routine skill in the art. *St. Regis Paper Co. v. Bemis Co. 193 USPQ 8.* Further, the test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art, given what is currently known in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981).

B) Applicant argues that the open channel, porous material-filled substrate bound column of Swedberg does not cure the deficiencies of Isaka and Overton. Applicant specifically argues that Swedberg expressly teaches away from chromatograph column devices formed in silicon substrate because its object is to provide miniaturized column devices that are laser ablated in a substantially planar substrate which is formed of a foreign material.

In response, Swedberg was combined with the teaching of Isaka and Overton only for the teaching of immobilizing antibodies, antigens, and other biological affiants into column matrices for capturing biological components and separating them from other components in the sample. Various substrates and matrices, whether formed of silicon or other material, are known to be derivatized so as to allow immobilization of antibodies or antigens as capture agents for the purpose of providing a capture function. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the stationary phase in the porous matrix taught by Isaka, in a device having multiple columns as modified by Overton, to include antigens and antibodies as taught by Swedberg in order to achieve performance of both filtration and capture function because Swedberg specifically suggested potential application of his teachings in monitoring biological analyses as applied to liquid phase separation devices in the miniature scales such as the device taught by Isaka.

C) Applicant argues that the teaching of Miura does not cure the deficiencies of the combination of Isaka and Miura. Applicant reiterates that Overton teaches non-analogous art. Applicant argues that Isaka, Overton, and Miura fail to teach or suggest a memory device on the substrate, a vacuum source in operative communication with a porous region, and that Miura only teaches use of positive pressure to facilitate movement of a sample.

In response, both of Overton and Miura each include a memory device. Although not specifically disposed on the substrate, it would have been obvious to one of ordinary

skill in the art at the time the invention was made to dispose the memory device taught by Isaka as modified by Overton and Miura, into a substrate because it has been held that rearranging parts of an invention involves only routine skill in the art. *In re Japikse, 86 USPQ 70.* Also, it has been held that forming in one piece an article which has formerly been formed in two separate pieces and put together, i.e. memory device [disposed] on the substrate, involves only routine skill in the art. *Howard v. Detroit Stove Works, 150 U.S. 164 (1893)).*

In addition, Miura, indeed, teaches a migration facilitator comprising a pump that is fed under positive pressure into the feed pump to facilitate movement of the sample (column 4, lines 4-59). Alternatively, Applicant, by way of disclosure at page 14, lines 9-10 in the specification admits that migration facilitators may alternatively comprise a vacuum source well known in the art which exerts a negative pressure in order to pull a sample along a capillary column.

D) Applicant argues that the teachings of Northrup does not cure the deficiencies of the combination of Isaka and Overton. Applicant contends that Northrup does not provide any suggestion or motivation to combine the single porous column of Isaka with the multiple interconnected columns of Overton to produce the claimed invention.

In response, Northrup was combined with the teaching of Isaka and Overton only for the teaching of electrodes within or adjacent porous membranes which are used to control flow of electrically charge biochemical species such as in electrophoresis, i.e.

negative electrode is formed at one end (inlet) of a column and a positive electrode is formed is formed at an opposite end of a column, thereby forming microelectrophoresis channels. Further, although the Northrup reference was not depended upon, as a secondary reference for the teaching of multiple microchannels, it is noted that the Northrup reference exemplifies multiple microelectrophoresis channels (more than one channel) in his device. Therefore, contrary to Applicant's argument, Northrup, does provide a suggestion to fabricate multiple microchannels in a chromatographic device, if desired.

E) Applicant argues that neither the multiple disconnected, substrate-bound porous columns of Northrup nor the electrophoretic-media filled capillary tubes used in Sunzeri, cures the deficiencies of the combination of Isaka and Overton. Applicant contends that Northrup and Sunzeri do not provide any suggestion or motivation to combine the single porous column of Isaka with the multiple interconnected columns of Overton to produce the claimed invention.

In response, Northrup was combined with the teaching of Isaka and Overton only for the teaching of electrodes within or adjacent porous membranes which are used to control flow of electrically charge biochemical species such as in electrophoresis, i.e. negative electrode is formed at one end (inlet) of a column and a positive electrode is formed is formed at an opposite end of a column, thereby forming microelectrophoresis channels. Sunzeri was further combined thereinafter for the teaching of incorporating internal or external standards into a column chromatographs. It would have been

obvious to one of ordinary skill in the art at the time of the instant invention to incorporate internal standards or controls as taught by Sunzeri and migration facilitator as taught by Northrup, into the miniaturized chromatographic device taught by Isaka as modified by Overton and Northrup, because internal controls or standards in column chromatographic devices are conventional and are standard laboratory practice to those well within ordinary skill.

F) Applicant argues that Thakur '159 does not anticipate the teaching of the claimed invention because it fails to expressly or inherently describe a flow inlet connected to a flow channel as recited in claim 105-107. Applicant specifically argues that Thakur '159 does not teach a flow channel that would permit flow of analyte in a sample as in ultrasmall flow channel device.

In response to Applicant's argument that Thakur '159 's trench capacitor is not a "flow channel" and does not have a flow inlet, it is noted that Thakur '159 discloses an elongate trench, i.e. a flow channel, that is formed from hemispherical grained silicon in the trench capacitor; thus, as recited, Thakur '159 anticipates the claimed invention. In response to Applicant's argument that the elongate trench of Thakur '159 does not permit flow of analyte, such a feature is not recited in the rejected claims. Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

G) Applicant argues that Thakur '847 does not anticipate the teaching of the claimed invention because it fails to expressly or inherently describe a flow inlet connected to a flow channel as recited in claim 105-107 but rather describes a container structure that is an open topped structure on wall of HSG. Applicant specifically argues that Thakur '847 does not describe that a hemispherical polysilicon may be deposited to permit a sample to flow through an elongate trench within which the HSG is deposited.

In response to Applicant's argument that Thakur '847 's container structure is an open topped structure on wall of HSG, it is not a "flow channel", and does not have a flow inlet, it is noted that Thakur '847 discloses an elongate trench on a surface of a substrate which includes silicon oxide and wherein HSG is selectively etched and formed thereon, i.e. a flow channel; thus, as recited, Thakur '847 anticipates the claimed invention. In response to Applicant's argument that the elongate trench of Thakur '847 does not permit flow of analyte, such a feature is not recited in the rejected claims. Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). Further, it is noted that the recited claims fail to provide how the structure of the trenches, i.e. elongate as taught by Thakur '847 would have been modified structurally or functionally, so as to permit any sample in question to flow and render the claimed invention distinct from the prior art. It has been held that a recitation with respect to the manner in which a fabricated apparatus, i.e. ultrasmall channel device is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus satisfying the claimed structural limitations. *Ex parte*

Masham, 2 USPQ2d 1647 (1987). Additionally, Thakur '847 specifically teaches individually disposed or deposited silicon oxide layers, *selectively* etched silicon oxide layers, *selectively* roughened by seeding and annealing of smooth silicon oxide layers. Thus, any additional silicon oxide layers, i.e stationary phase, over top of a selectively roughened silicon oxide layer, HSG, in Thakur's teaching, would have only constituted an obvious design choice.

H) Applicant argues that the combination of Crenshaw with Isaka, Overton, and Northrup would not have suggested the claimed invention and the addition of Crenshaw fails to cure the deficiencies of the combined teaching of Isaka, Overton, and Northup. Applicant specifically argues that Crenshaw does not teach flow channels and the matrices formed in the substrate and not over the substrate. Additionally, Applicant argues that HSG is not an obvious variation of silicon since Crenshaw does not discuss porosity of silicon, nor do Isaka and Northrup who discuss porous silicon, discuss HSG as an obvious variation.

In response, Crenshaw is incorporated with the combined teaching of Isaka, Overton, and Northrup only for the teaching of porous silicon matrix comprising hemispherical grained silicon (HSG). In response to Applicant's contention that Crenshaw does not describe nor discuss porosity, it is noted in column 1, lines 26-30 of Crenshaw that HSG enhances surface area, by virtue of grain size and separation dimensions, which are a function of porosity for silicon matrices. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the instant invention to

substitute the porous silicon matrix disclosed by Isaka or Northrup as modified by Overton, with HSG as taught by Crenshaw because Crenshaw specifically taught that HSG is used to increase surface area in trench capacitors and Northrup specifically taught that porosity in silicon structures increases surface area in miniaturized separation flow channels such as in his electrophoresis device or the microchannel separation device disclosed by Isaka so that HSG appears to constitute an obvious variation of porous silicon used in separation devices.

13. For reasons aforementioned, no claims are allowed.

14. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

15. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Gailene R. Gabel whose telephone number is (703) 305-0807. The examiner can normally be reached on Monday to Thursday from 7:00 AM to 4:30 PM. The examiner can also be reached on alternate Fridays from 7:00 AM to 3:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Long Le can be reached on (703) 305-3399. The fax phone number for the organization where this application or proceeding is assigned is (703) 308-4242.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0196.

Gailene R. Gabel
Patent Examiner
Art Unit 1641
1/10/03

LONG V. LE
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1600
1/13/03